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UPI-Enabled Digital Savings Bank with Automated Goal-Based Algorithm

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Abstract - *The rapid advancement of digital payment technologies has transformed financial transactions by enabling instant, secure, and seamless fund transfers. The Unified Payments Interface (UPI) has significantly contributed to financial inclusion and digital adoption in India. However, existing UPI-based applications primarily focus on transaction execution and lack structured savings planning features. This results in fragmented financial management, where users rely on separate tools for payments and savings tracking.*

*This paper proposes **UPI Savings Money Bank**, a full-stack web-based financial platform that integrates UPI-style payment simulation with an automated goal-based savings algorithm. The system allows secure registration using OTP-based authentication, encrypted password storage, session-based login, savings goal creation, and direct allocation of funds to selected goals. The backend is developed using Node.js and Express.js, while PostgreSQL ensures secure relational data management. Email notifications are implemented using Nodemailer to enhance transparency and user engagement.*

The proposed algorithm dynamically calculates savings progress and updates financial goals in real time. Performance evaluation demonstrates low response latency (<800 ms), secure transaction handling, and reliable data consistency. The system promotes disciplined financial behavior by combining digital payments with structured savings management in a unified platform.

Key Words: **Digital Payments, UPI, Goal-Based Savings, Node.js, PostgreSQL, Full-Stack Web Application, OTP Authentication, Financial Technology**

1. INTRODUCTION

Digital payment systems have significantly improved financial accessibility and transaction efficiency. UPI enables real-time bank-to-bank transfers without sharing account details, enhancing financial inclusion. Despite this advancement, most digital payment platforms focus only on transaction execution and do not provide integrated financial planning tools.

The increasing adoption of smartphones and internet banking has accelerated the growth of digital transactions across urban and rural regions. Users now prefer instant and contactless payment systems over traditional banking methods. However, the convenience of fast transactions does not automatically translate into effective financial management. Many users struggle to maintain savings discipline because digital payment platforms are primarily transaction-oriented rather than savings-oriented.

Users who aim to save money for specific goals often depend on spreadsheets, manual tracking, or separate financial applications. This fragmented approach reduces financial discipline and limits effective savings planning. Managing multiple applications for payments and savings creates inconvenience and reduces user engagement with structured financial planning.

The proposed system integrates payment simulation with structured goal-based savings, providing users with a unified digital financial platform. By combining transaction capability with savings tracking, the system encourages responsible spending and systematic financial growth.

1.1 Problem Statement

Existing digital payment applications enable fast and secure transactions but lack structured savings planning features. Users must rely on separate systems for managing financial goals. The absence of integrated savings tracking, real-time progress visualization, and automated allocation mechanisms reduces user engagement and financial awareness.

Furthermore, traditional savings tracking methods do not provide instant feedback after a transaction is completed. Users are unable to clearly visualize how each payment contributes toward long-term goals. This disconnect between spending and saving leads to reduced motivation and inconsistent financial behavior.

Many financial applications also lack personalized dashboards that combine both payment history and savings growth in a single interface. Without automation, users must manually update their savings records, increasing the chances of errors and inconsistencies.

Therefore, there is a need for a secure, unified platform that combines digital payment functionality with automated goal-based savings management. The system must ensure data security, ease of use, and real-time updates to improve financial discipline.

1.2 Objectives

The primary objectives of the proposed system are:

- To develop a secure web-based digital savings platform
- To implement email-based OTP authentication
- To integrate simulated UPI-style payments
- To design an automated goal-based savings algorithm
- To provide real-time savings progress visualization
- To send automated email notifications for financial activities

In addition to these objectives, the system aims to create a user-friendly interface that simplifies financial planning for individuals with varying levels of technical knowledge. The platform also intends to ensure scalability so that it can support multiple users simultaneously without performance degradation. Another objective is to maintain data integrity and prevent unauthorized access through secure backend validation mechanisms.

2. LITERATURE REVIEW

Several studies highlight the growth of digital payment systems and financial management tools. Digital banking adoption has increased due to improved infrastructure, regulatory support, and user-friendly mobile applications. Researchers emphasize that financial technology innovations play a crucial role in promoting economic growth and financial inclusion.

Kumar et al. (2022) analyzed digital payment adoption trends and found that integrated financial tools improve user engagement. Sharma and Patel (2021) demonstrated that goal visualization increases savings discipline by over 25%. The Reserve Bank of India's Digital Payment Index (2023) emphasizes secure authentication mechanisms such as OTP-based verification in financial platforms. NPCI's UPI documentation explains real-time transaction processing architecture. Singh et al. (2020) discussed full-stack fintech architectures integrating secure backend frameworks with relational databases.

Although prior research focuses on payment efficiency and financial planning separately, limited work has been done on combining both functionalities into a single automated system. This gap in research motivates the development of an integrated platform that connects digital payments with structured savings mechanisms.

3. SYSTEM ARCHITECTURE

The system follows a three-tier client-server architecture designed to ensure scalability, security, and maintainability. The modular architecture allows independent development and maintenance of frontend, backend, and database components. This separation of concerns improves performance optimization and future scalability.

3.1 Presentation Layer

The frontend is developed using HTML, CSS, and JavaScript. It provides:

- User Registration Interface
- OTP Verification Page
- Dashboard View
- Savings Goal Creation Interface
- Payment Simulation Page

The frontend communicates with backend APIs using HTTP requests and session-based authentication.

3.2 Application Layer

The backend is developed using Node.js and Express.js. It handles:

- OTP generation and verification
- Password hashing using bcrypt
- Payment processing logic
- Goal progress calculation
- Email notification triggering

The backend ensures secure API routing, session management, and database communication. Business logic for automated savings calculation is implemented within this layer to maintain system integrity and consistency.

3.3 Data Layer

PostgreSQL database ensures structured storage of users, goals, and payments. Foreign key constraints maintain data integrity. The relational database model ensures consistency, avoids redundancy, and supports efficient query execution. Backup mechanisms and structured schema design further enhance data reliability.

4. AUTOMATED GOAL-BASED SAVINGS ALGORITHM

The system implements an algorithm that automatically updates savings progress upon each transaction. The primary purpose of this algorithm is to ensure that every deposit made by the user is accurately reflected in the selected savings goal without manual intervention. The automation minimizes calculation errors and maintains consistency between transaction records and savings balances.

The algorithm is triggered immediately after successful payment validation. It retrieves the current saved amount from the database and performs arithmetic computation to determine the updated value. This real-time processing

ensures that users receive instant feedback on their savings growth.

Algorithm Steps:

1. User selects a savings goal.
2. User enters amount to deposit.
3. System validates:
   - Amount > 0
   - Goal exists
   - User session valid
4. Retrieve current saved amount.
5. Compute:
   New_Saved_Amount = Current_Saved + Deposit_Amount
6. Calculate progress percentage:
   Progress% = (New_Saved / Target_Amount) × 100
7. Update database.
8. Send confirmation email.

The algorithm ensures atomic database operations to prevent inconsistencies during concurrent transactions. It also prevents over-allocation by validating that the saved amount does not exceed the target amount. This structured automation promotes disciplined financial tracking.

5. SYSTEM IMPLEMENTATION

The system implementation follows a modular development approach, where each functional unit is developed and tested independently before integration. This approach enhances maintainability and simplifies debugging. The backend server processes client requests through RESTful APIs and responds with structured JSON data.

The application was developed using industry-standard web technologies to ensure reliability and scalability. Error handling mechanisms are implemented to manage invalid inputs, unauthorized access, and database failures. Logging mechanisms are also included to track system activity and improve troubleshooting efficiency.

5.1 Authentication Module

Implements email OTP verification and password hashing using bcrypt. The OTP is randomly generated and sent to the registered email address to verify user identity during registration. Password encryption ensures that sensitive credentials are never stored in plain text format.

Session management techniques are used to maintain secure login states. Unauthorized access attempts are blocked through backend validation. These measures significantly enhance platform security.

5.2 Savings Goal Module

Allows users to create goals with target amounts and monitor progress. Each goal is uniquely associated with a specific user through foreign key relationships in the database. The system provides real-time updates whenever funds are added to a goal.

Users can view their savings percentage, remaining balance, and transaction history through the dashboard. This transparency encourages better financial planning and accountability.

5.3 Payment Module

Simulated UPI interface for allocating funds directly to selected goals. The module validates user input before processing transactions to ensure data accuracy. Once validated, the transaction details are stored securely in the payments table.

The integration between the payment module and savings module ensures that every successful transaction automatically updates the corresponding savings goal. This tight integration reduces manual effort and improves user experience.

5.4 Notification Module

Sends automated emails for OTP verification, account creation, and savings updates. These notifications enhance user trust by providing confirmation of financial activities.

The email system ensures timely communication using SMTP protocols. By informing users about their savings progress, the system increases engagement and transparency.

6. DATABASE DESIGN

The system uses PostgreSQL relational database to ensure structured and secure data storage. The relational model enables efficient querying, data consistency, and integrity constraints. Proper indexing techniques are applied to optimize query performance.

The database schema is designed to minimize redundancy and maintain normalization standards. Relationships between tables are enforced using foreign keys to ensure referential integrity.

- **Users Table**
- user_id
- email
- username
- password

This table stores authentication and identification information. Unique constraints prevent duplicate accounts.

- **Savings Goals Table**
- goal_id
- goal_name
- target_amount
- saved_amount

- user_id (Foreign Key)

This table maintains goal-specific financial data and links each goal to its respective user.

- **Payments Table**
- payment_id
- goal_id
- amount
- payment_date

This table records every transaction associated with a savings goal. Timestamp fields enable chronological tracking of financial activities.
The structured database design ensures secure and efficient financial data management.

7. RESULTS AND PERFORMANCE ANALYSIS

The system was tested under multiple user scenarios to evaluate functionality and performance. Testing included registration validation, login authentication, goal creation, and simulated payment transactions.

Test Case	Result
User Registration	Successful
OTP Verification	Validated
Goal Creation	Stored correctly
Payment Processing	Updated in < 1 sec
Email Notification	Delivered successfully

Performance evaluation confirms that the system operates efficiently within acceptable latency limits. The integration between modules functions smoothly without transaction errors.

8. COMPARISON WITH EXISTING SYSTEMS

Feature	Traditional UPI Apps	Savings Apps	Proposed System
UPI Payments	Yes	No	Yes (Simulated)
Goal Tracking	No	Yes	Yes
Integrated Platform	No	No	Yes
OTP Security	Yes	Limited	Yes
Email Alerts	Limited	No	Yes

Traditional UPI applications primarily focus on transaction execution without structured savings support. Savings applications provide tracking but lack integrated payment functionality. The proposed system combines both features within a single platform, offering automation, security, and convenience.
This integration differentiates the system from existing solutions and enhances overall financial management efficiency.

9. CONCLUSION

The UPI Savings Money Bank successfully integrates digital payment simulation with automated goal-based savings management in a unified web-based platform. The system addresses the limitations of existing digital payment applications by combining transaction functionality with structured financial planning tools. By linking each payment directly to a savings goal, the platform ensures that users can clearly visualize their financial progress in real time.

The implementation of OTP-based authentication and encrypted password storage enhances security and protects user data from unauthorized access. The automated goal-based algorithm ensures accurate calculation and immediate updating of savings progress after each transaction. This real-time synchronization between payment records and savings data improves transparency and reliability.

Performance testing confirms that the system operates efficiently under multiple user scenarios, maintaining low response time and consistent database updates. The modular full-stack architecture ensures scalability and maintainability, allowing future enhancements without major structural changes.

Overall, the project demonstrates how full-stack web development technologies can be effectively utilized to build secure and intelligent financial management applications. The integration of payments and savings in a single platform promotes disciplined financial behavior and improves user engagement.

10. FUTURE WORK

Although the current system achieves its objectives, several enhancements can further improve functionality and scalability. One significant improvement would be integrating real UPI APIs to enable actual bank-level transactions instead of simulated payments. This would transform the application from a prototype system into a fully operational fintech solution.

Developing a dedicated mobile application for Android and iOS platforms would increase accessibility and user adoption. Mobile push notifications could replace or complement email notifications for faster communication.
Artificial Intelligence-based recommendation systems could be implemented to analyse user spending patterns and suggest optimized savings strategies. Advanced data visualization tools, such as graphical dashboards and predictive analytics, could further enhance user understanding of financial trends.

Security can be strengthened by introducing multi-factor authentication and token-based API access. Additionally, deploying the system on cloud infrastructure would improve

scalability, availability, and performance under high user loads.

These future enhancements would expand the system's capabilities and position it as a comprehensive digital financial management platform.

REFERENCES

[1] NPCI, "Unified Payments Interface Procedural Guidelines," 2024.

[2] Reserve Bank of India, "Digital Payment Index Report," 2023.

[3] A. Kumar et al., "Adoption of Digital Payment Systems in India," IJFMR, 2022.

[4] P. Sharma and R. Patel, "Goal-Based Savings Applications," IEEE FinTech Conference, 2021.

[5] OWASP Foundation, "Web Application Security Guidelines," 2023.